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Supreme Court, U.S.
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In the Supreme Court of the United States

OCTOBER TERM, 1970

FEDERAL POWER COMMISSION, PETITIONER

v.

FLORIDA POWER & LIGHT COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FIFTH CIRCUIT

BRIEF FOR THE FEDERAL POWER COMMISSION

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v.

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BRIEF FOR THE FEDERAL POWER COMMISSION

OPINIONS BELOW

The opinion of the court of appeals (App. 354–374) is reported at 430 F. 2d 1377. The opinion and orders of the Federal Power Commission (App. 251–254, 283–306, 327–329, 329–330) are reported at 37 F.P.C. 544 and 37 F.P.C. 833. The opinion of the hearing examiner (App. 254–282) is reported at 37 F.P.C. 560.

JURISDICTION

The judgment of the court of appeals was entered on July 13, 1970 (App. 375). By order dated October 5, 1970, Mr. Justice Black extended the time within which to file a petition for a writ of certiorari to November 10, 1970, and the petition was filed on that

date. The petition was granted on February 22, 1971 (App. 376). The jurisdiction of this Court is invoked under 28 U.S.C. 1254(1) and Section 313(b) of the Federal Power Act (16 U.S.C. 825*l*(b)).

QUESTION PRESENTED

Whether the Federal Power Commission properly determined that the interconnection of an electric power utility with an interstate transmission grid involved "transmission of electric energy in interstate commerce" and thus made the utility subject to the Commission's regulatory jurisdiction.

STATUTE INVOLVED

Section 201 of the Federal Power Act, as added, 49 Stat. 847 (16 U.S.C. 824), provides in pertinent part:

* * * * *

> (b) The provisions of this Part shall apply to the transmission of electric energy in interstate commerce and to the sale of electric energy at wholesale in interstate commerce, but shall not apply to any other sale of electric energy or deprive a State or State commission of its lawful authority now exercised over the exportation of hydroelectric energy which is transmitted across a State line. The Commission shall have jurisdiction over all facilities for such transmission or sale of electric energy, but shall not have jurisdiction, except as specifically provided in this Part and the Part next following, over facilities used for the generation of electric energy or over facilities used in local distribution or only for the transmission of electric energy in intrastate commerce,

or over facilities for the transmission of electric energy consumed wholly by the transmitter.

(c) For the purpose of this Part, electric energy shall be held to be transmitted in interstate commerce if transmitted from a State and consumed at any point outside thereof; but only insofar as such transmission takes place within the United States.

* * * * *

(e) The term "public utility" when used in this Part or in the Part next following means any person who owns or operates facilities subject to the jurisdiction of the Commission under this Part.

STATEMENT

This case involves the Federal Power Commission's determination that the Florida Power & Light Company ("FPL") owns and operates facilities for the transmission of electric energy in interstate commerce and thus is subject to the Commission's jurisdiction under Section 201 of the Federal Power Act, 16 U.S.C. 824. Although the only immediate impact of the determination would be to require FPL to follow the Commission's Uniform System of Accounts, the establishment of jurisdiction would empower the Commission, under appropriate circumstances, to direct FPL to interconnect with and sell power to other utilities or distributors, thereby improving the reliability of service to consumers, and would enable the Commission to regulate FPL's future sales of interstate power at wholesale. The court of appeals reversed the order of the Commission, rejecting the methods adopted by the Commission in determining that FPL transmits electricity in interstate commerce.

A. THE ELECTRIC UTILITY SYSTEMS INVOLVED

FPL. The facts developed before the Commission in the administrative proceeding initiated in 1965 (App. 251) show that FPL owns and operates extensive generation, transmission and distribution facilities providing retail and wholesale electric energy in southern and eastern Florida; it is the largest electric utility in the state and ninth in the nation in terms of revenues.[1] FPL operates ten steam-electric generating facilities with a net dependable generating capacity of 2.8 million kilowatts, has a 2,600 mile transmission grid and serves about 931,400 customers (App. 9–11). While all the company's facilities are physically located within Florida and none extend to the state line, FPL is interconnected with the Florida Power Corporation ("Corp"), which has several transmission connections at the Georgia state line (App. 14, 191).

The Florida Operating Committee. In addition to its interconnections with Corp, FPL is joined with three other Florida electric utilities—Tampa Electric Company ("Tampa"), Orlando Utilities Commission ("Orlando") and the City of Jacksonville ("Jacksonville") (App. 11, 12, 286). FPL, Corp and Tampa form the Florida Operating Committee with Orlando and Jacksonville as associate members (App. 189, 286). The members of the Committee coordinate the installation and maintenance of their generating facilities (App. 23–24), and the Committee meets several times a year to discuss mutual problems relating to their interconnected operations.

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[1] Unless otherwise indicated, the figures throughout the brief are for 1964.

Although during normal periods of operation FPL's generating capacity is sufficient to meet its loads and the output of its generators is controlled by computer to match the ever changing combined total of such loads (App. 71, 72, 257), FPL depends upon the other members of the Committee for emergency power (App. 23–24, 32). In a report to the Commission for the year 1964, FPL acknowledged this reliance on other Committee members for reserves; to meet a required reserve generating capacity (as defined by the reporting form, FPC Form 12) of 404,000 kilowatts, FPL listed 172,000 kilowatts from its own generating facilities and 232,000 kilowatts from the facilities of other Committee members (App. 32, 286).

As a result of interconnected operations, substantial quantities of electric energy are interchanged among Committee members (App. 185). These interchanges are either scheduled or inadvertent. Scheduled interchanges take place after consultations among the respective system dispatchers to meet the power needs of particular members.[2] Inadvertent interchanges of energy include both intentional interchanges resulting from the operation of frequency bias (see pp. 9–10, *infra*) and unscheduled interchanges resulting from human or equipment error (App. 203–210, 259). Both scheduled and inadvertent interchanges—usually taking place concurrently (App.

[2] The Florida utilities do not engage, as do some electric pools, in scheduled interchanges for economy purposes to take advantage of differences among utilities in incremental costs of producing power.

203–210)—are measured, netted and paid for as necessary at regular intervals (App. 109–110, 258–259).

Corp's relationship with the Southern Company System. Corp (which is interconnected with FPL) is interconnected across the Georgia-Florida state line with the Georgia Power Company ("Georgia") (App. 191), a subsidiary of the Southern Company whose other subsidiaries are the Gulf Power Company ("Gulf") operating in northwestern Florida, the Alabama Power Company ("Alabama") and the Mississippi Power Company (App. 14, 286–287). Corp also has interconnections with Gulf, which in turn has interconnections with Alabama and Georgia (App. 38, 189, 287). Georgia is interconnected with the Duke Power Company, the Tennessee Valley Authority and the Southeastern Power Administration, which systems operate in states beyond Georgia (App. 287–288).

Pursuant to an agreement, Corp makes available to the Southern Company subsidiaries 100,000 kilowatts of its generating capacity during the summer in return for Southern's contribution of 100,000 kilowatts of capacity to Corp in the winter (App. 287). During 1964, Corp delivered to Southern 157 million kilowatt-hours (kwh) of electric energy, of which 82 million were delivered to Georgia; Southern, in turn, sent 167 million kwh to Corp, of which 97 million came from Georgia (*ibid.*). On many occasions during the year, including peak load periods, there was a flow in both directions during a 24-hour period over the Corp-Georgia interconnections (App. 260). The Southern Company utilities also wheeled (transmitted across their territories) 3.9 million kwh from the South-

western Power Administration across the Georgia-Florida state line to Corp (*ibid.*).

The Interconnected Systems Group. All of the power companies mentioned thus far, including FPL, are among the 140 interconnected utilities making up the voluntary Interconnected Systems Group ("ISG") spanning the southeastern and central portions of the United States (App. 12–13, 187, 188, 288). By virtue of their interconnection, the 140 ISG members operate in synchronism and render each other emergency assistance when needed (App. 13, 41, 288). For example, the record shows one instance in 1965 when FPL contributed, through its interconnection with Corp, 8 megawatts of generating capacity to meet a 580 megawatt loss of generation on a midwestern system (App. 21–22, 288, 347).

B. THE INTERDEPENDENCE OF FPL AND THE OTHER ISG UTILITIES AS A BASIS FOR JURISDICTION—THE "ELECTROMAGNETIC UNITY" THEORY

It is undisputed that Commission jurisdiction over FPL is established if FPL's facilities transmit electric energy "in interstate commerce" within the meaning of Section 201(b) of the Federal Power Act; Section 201(c) states that electric energy shall be deemed to be transmitted in interstate commerce "if transmitted from a State and consumed at any point outside thereof * * *." In an effort to meet the burden of establishing that transmission had indeed taken place between FPL and Georgia, the Commission's staff presented evidence in the administrative proceeding showing that all elements of an interconnected

electric network are physically interdependent in that the occurrence of an event on one part of the network affects every element of the entire system. In substance, the staff's evidence was as follows:

Electric power on the FPL, Corp, Georgia and other ISG systems is supplied as alternating current at an average frequency of 60 cycles per second. Because the systems necessarily operate in synchronism or "parallel," the frequencies on the systems correspond exactly; all generating units connected to the common network experience the same changes in frequency and all electric clocks connected to such a network keep precisely the same time (App. 35, 38–39).

All the electric energy produced by all of the generators of the members of ISG (or any interconnected network) is delivered to the common, integrated transmission grid of the network, from which all of the network's customers are served (App. 35). As there is no way of storing electric energy, the total generation of a network is constantly adjusting to match the network's total load (App. 39).[3] In order

[3] When a load is added suddenly to a network (or when there is a sudden outage of a generating unit) each generating unit on the network almost instantly experiences a loss of speed as a portion of the mechanical energy of rotation of each generator is converted into additional electric energy (App. 40–41, 137). The aggregate of such conversions supplies the added electric energy needed to supply the load or make up for the generating outage (App. 41). Following this initial reaction, the governors on some generators will react in accordance with frequency bias (see pp. 9–10, *infra*) to cause additional steam to be applied to the turbines thereby speeding up those generators, producing more energy and returning the network frequency to normal (App. 137–138). When loads are removed from the network, the same procedure oper-

to assure that loads of a given member of the ISG are met ultimately by generation on that member's system or a neighboring system with which the member has special arrangements, and in order to assure that frequency is maintained as close to 60 cycles per second as possible, each system employs what is known as tie line[4] control with frequency bias.

FPL's tie line control (like that of the other systems) involves the programming of FPL's dispatching computer to direct FPL's generators to produce enough electric energy to supply FPL's loads and transmission losses plus FPL's scheduled net interchange of energy to the other members of the Florida Operating Committee (App. 32–34, 36–37).[5] Frequency bias acts to shift net interchange schedules automatically with changes in frequency; a reduction in frequency leads to an increase in each system's net interchange obligation (*i.e.*, each system must increase its generation to restore the 60 cycle frequency) and an increase in frequency conversely leads to a reduction of each system's net interchange obligation (App. 34–38, 139–141).

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ates in reverse: generators initially speed up as no longer needed electric energy is converted to mechanical energy, governors react to reduce steam and the generators slow down, returning frequency to 60 cycles per second.

[4] A tie line is a transmission line connecting different electric systems.

[5] Scheduled interchanges are always "net" as the actual moment-to-moment flows of power within a given system or between systems cannot be controlled. As a result, net interchanges are not scheduled for a particular tie line; only the net of inflows and outflows over all of a system's tie lines is controlled (App. 32–38).

The mechanics of tie line control with frequency bias can best be illustrated by a simple, hypothetical example. Assume that the ISG network is in balance with frequency at 60 cycles per second, with total generation matching total load plus losses and with all scheduled net interchanges being met. If a load is now added to the FPL system with no other changes on the entire network, the following sequence of events will occur: First, an almost instantaneous drop of frequency and generator speed will occur throughout the network as a portion of the mechanical energy of rotation of every generator is converted into electric energy to meet the load. This drop in frequency will automatically increase each constituent system's net interchange obligation.[6] Each system including FPL will then begin to increase its generation to comply with its proportionate new net interchange obligation so as to restore the 60 cycle frequency. FPL must in addition eventually increase its generation by the amount of the load added to its system, so that the frequency may be retained at 60 cycles with all interchange values returned to their scheduled levels.[7]

[6] ISG recommends that its members set their frequency bias so that for each drop in frequency of one-tenth of a cycle per second on the interconnected network, the net interchange obligation of the member will increase by an amount equal to one percent of the member's annual peak load (App. 36–37, 141, 334). Thus, each member contributes to emergencies and helps regulate frequency in proportion to the size of its system.

[7] If for some reason FPL was unable to meet its new load or to replace lost generation, an FPL dispatcher would arrange for the load or generation loss to be met by a neighboring system and scheduled net interchange values would be reset

A staff witness explained the benefits which accrue to a member of an interconnected network (App. 41–42). Because of the magnitude of the system, deviations in frequency from 60 cycles per second are kept to a minimum. As a result, transfers of non-scheduled energy between systems and unnecessary speed-ups and slow-downs of generating equipment are also minimized, clocks keep more nearly perfect time and many precision industrial operations are improved (*ibid.*). Of equal importance, FPL receives automatic assistance during emergencies, including assistance from the non-Florida ISG utilities up to the 100 megawatt capacity of the Corp-Georgia tie line (App. 41, 288).

In short, FPL operates in "electromagnetic unity" (App. 38–39) with the other members of the ISG system and receives significant benefits from such operation.

C. THE TRACING OF ELECTRIC ENERGY AS A BASIS FOR JURISDICTION—THE "COMMINGLED METHOD" VERSUS THE "SYSTEMS STUDY METHOD"

As an alternate basis for showing interstate transmissions over FPL's facilities, the staff utilized a method of tracing power flows known as the "commingled method." Two studies were offered by the staff. The first analyzed data from FPL's and Corp's commercial meters to show that, during designated

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accordingly. During the time it might take the dispatcher to complete the transaction, the load or loss of generation would be met by all ISG members operating under frequency bias (App. 140–141).

hours on each of 22 days in a four-month period in 1964, electric energy flowed from Georgia to FPL over Corp's facilities, becoming commingled en route with energy from other sources at one or more Corp buses[8] (App. 15–21, 191–202). A second study similarly showed that, during designated hours on three summer days in the same year, electric energy flowed from FPL through Corp—where it was also commingled with energy from other sources—to Georgia (App. 53–56, 211–226).

In rebuttal of the staff's case, an FPL witness contended that the "systems study method" of tracing power flows was preferable to the commingled method (App. 83–86). Using systems study principles, the witness examined the staff studies and concluded that electric energy had not flowed from Georgia to FPL or from FPL to Georgia during the designated periods (App. 86–92).

A staff witness, Dr. Joseph Jessel, explained the basic concepts and assumptions underlying the different tracing methods (App. 45–51). He acknowledged that both methods employed rough approximations and simplifications of an actual electric power system (App. 49) in order to make use of the data available from the commercial meters used by utilities (App. 44–54, 150). Because commercial meters measure only average values, they fail to reflect the fact that power flows in positive and negative pulses in each phase of

[8] A bus is a set of three conductive bars used to join together two or more transmission lines.

the three phase alternating current system employed by all modern utilities (App. 42–45).[9]

The basic difference between the two tracing systems lies in their treatment of the bus. Under the commingled method, each bus is treated as a single point or reservoir so that power entering the bus on one transmission line is considered to be commingled with power entering on all other transmission lines and thus is deemed present ratably on each outgoing circuit[10] (App. 48–49, 165). The systems study method, on the other hand, represents a bus as a single conductor with physical dimensions and seeks to trace net power flows within the bus (App. 165). Dr. Jessel gave his opinion that the commingled method of tracing more nearly represents an actual three phase electric power system because, by treating a bus as a point, it in effect takes into account the fact that power pulses back and forth on each phase of an actual bus (App. 49, 146–147). Dr. Jessel also

[9] Each phase of three phase power is transmitted separately from generator to distribution point. Transmission lines thus come in threes, which accounts for the three bars of each bus—one bar for each phase. At several points during the proceedings, Dr. Jessel elaborated on the nature of three phase power and the problems of suitably representing it for tracing purposes (See App. 43–44, 131–155, 163–175, 240).

[10] To illustrate, Dr. Jessel hypothesized (App. 49):

> * * * [I]f circuit A contributes 60 percent of the incoming power to the junction point and circuit B contributes 40 percent of the incoming power to the junction point, then the distribution of power in each outgoing circuit is comprised of 60 percent A power and 40 percent B power, uniformly commingled.

noted that the commingled method had been used in other power flow studies presented at formal Commission proceedings (App. 47).

D. THE HEARING EXAMINER AND COMMISSION DECISIONS

The hearing examiner issued an initial decision in July 1966 (App. 254–282). Analyzing in considerable detail the evidence on the interdependence and synchronization of power utilities forming an interconnected system (App. 262–270), he found FPL's generators were interlocked electromagnetically with Georgia's, responding automatically and almost instantaneously to increases of load on Georgia's system and thereby reducing frequency variations and increasing the Georgia system's efficiency (App. 270). He noted that, if sensitive enough instruments were available, the response of FPL's generators to the turning on of a light on the Georgia system could be measured (App. 269). The hearing examiner concluded that (App. 270):

> The cause and effect relationship in electric energy occurring throughout every generator and point on the Georgia, Corp and [FPL] systems constitutes interstate transmission of electric energy by, to, and from [FPL]. It is the electromagnetic unity of response of [FPL], Corp, Georgia and other interconnecting systems that constitutes the interstate transmission of electric energy by [FPL].

The hearing examiner went on to consider the staff's tracing studies as an alternative basis for jurisdiction (App. 271–274), noting at the outset that the nature

of electric energy is not fully understood (App. 271) and that all tracing methods "transpose the complex dynamism of modern alternating current electric systems into simplified models on the basis of numerous assumptions" (App. 272). The examiner focused on the distinctive treatments of a bus by the commingled and systems study tracing methods (App. 272) and concluded that the commingled method's treatment of a bus as a point was more in consonance with the physics of transmission of alternating current than the systems study method's treatment of a bus as a single bar with physical dimensions (App. 272–274).[11] Having accepted the commingled method, the examiner found that the staff had proved the transmission of electric energy between FPL and Georgia over Corp's facilities (App. 274). The examiner accordingly found FPL to be subject to the Commission's jurisdiction and thus required to comply with the Commission's regulations under the Act (App. 282).[12] In an opinion issued in March 1967 (App. 283–300), the Commission affirmed the examiner's decision in substantially all respects. Two of the five Commissioners dissented (App. 301–306).

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[11] The examiner observed that the systems study tracing method might be useful for some types of engineering studies, where all that is desired is a mathematical answer, regardless of the physical dynamics of the situation (App. 273–274).

[12] In response to other contentions made by FPL, the examiner found that the facilities involved did not fall within the "local distribution" exemption of Section 201(b) (16 U.S.C. §824(b)), and that compliance with the Commission's accounting requirements would not be unduly costly or burdensome (App. 274–279).

E. THE COURT OF APPEALS DECISION

On review, the court of appeals reversed the Commission's order (App. 354–374), holding that the electromagnetic unity theory was insufficient, standing alone, to prove that power flowing from Corp to Georgia, whether scheduled or unscheduled, contained power generated by FPL, or that power flowing from Corp to FPL contained power generated outside of Florida (App. 364). As to the commingled tracing method, the court emphasized that the flow of electric energy was "not yet fully explainable" (App. 365) and held that the "engineering and scientific fact test for interstate flow of energy is not met by postulating a simplified characterization of how, for various purposes of convenience, energy may be treated as flowing" (App. 367–368). It distinguished the prior court of appeals cases upholding Commission jurisdiction over sales at wholesale (see pp. 27–31, *infra*) on the ground that in each of those cases the utility had concededly received interstate power, the only issue being whether such power reached specific customers; it found this case different because it involves the more fundamental question of whether FPL is subject to the provisions of the Federal Power Act at all (App. 368–373).

SUMMARY OF ARGUMENT

The legislative history of the Federal Power Act amendments of 1935, adopted in the wake of *Public Utilities Commission* v. *Attleboro Steam & Electric Co.*, 273 U.S. 83, shows that Congress was seeking to secure the planned coordination of interconnected

electric facilities and to regulate sales at wholesale of interstate electric energy placed beyond state regulatory authority by the *Attleboro* decision, all without unnecessary impairment of the authority of state regulatory commissions. Section 201 of the Federal Power Act reflects the various concerns of Congress. Commission jurisdiction over facilities for the transmission of electric energy in interstate commerce is established with precision—to be determined by an "engineering and scientific" fact test. *Connecticut Light & Power Co.* v. *Federal Power Commission,* 324 U.S. 515, 529. At the same time, general exemptions were provided to protect state authority. The issue presented by this case is whether the Commission's determination that FPL's facilities are used for the transmission of electric energy in interstate commerce, as a matter of scientific fact, was supported by substantial evidence. We submit that the Commission's determination, based on two alternative approaches, was supported by substantial evidence and that the court of appeals improperly substituted its own views for the Commission's expert decision.

A

There was substantial evidence in the record to support the Commission's conclusions that the electromagnetic unity of response of FPL and the other members of the multi-state Interconnected Systems Group constituted the interstate transmission of electric energy. The staff introduced expert evidence to the effect that all of the elements of an interconnected interstate electrical network are locked together in

electromagnetic unity and that the addition of a load to one part of the network would almost instantaneously effect every generator on the network. Other evidence concentrated on the degree of coordination of operations among FPL and its neighbors. In short, the evidence supported the conclusion that FPL was an integral part of a vast interstate network and received substantial benefits from its association.

Recent court of appeals decisions have approved basing Commission jurisdiction on the realities of interconnected electric utility operation in multi-state areas, without resort to the tracing of power flows. The Commission has noted that the nature of highly complex modern electric systems makes tracing impracticable in many instances and "irrelevant to present day power system technology". *Arkansas Power & Light Co.*, 34 F.P.C. 747, 751. The attempt of the court below to distinguish those decisions of other courts of appeals on the grounds that they all involved jurisdiction over sales at wholesale falls short of the mark; Congress employed the same factual standard for establishing jurisdiction over particular sales of electric energy at wholesale as it did for establishing plenary jurisdiction over individual utilities.

B

The Commission's acceptance of the staff's tracing studies, which were based on the commingled tracing method and showed that power had on occasion flowed from Georgia to FPL and from FPL to Georgia, was an adequate, independent basis for the assertion of

jurisdiction over FPL in this case. Although tracing is not always practicable at the present stage of electric technology, the staff was able to complete a study here. The use of the commingled tracing method was justified by expert testimony which established that the method's treatment of a bus as a point took into account the realities—as nearly as they are known—of three phase power transmission. The commingled method has in the past been employed with court approval in jurisdictional cases.

ARGUMENT

I. INTRODUCTION

Part II of the Federal Power Act (Sections 201–209, 16 U.S.C. 824–824h) was added in 1935, 49 Stat. 847, to bring interstate transmissions and sales of electric energy under federal regulation following this Court's decision in *Public Utilities Commission* v. *Attleboro Steam & Electric Co.*, 273 U.S. 83, that interstate sales at wholesale were beyond the reach of state regulatory authorities.[13] As is shown by the legislative history, the amended Act sought to accommodate two competing aims. On the one hand, Congress recognized the rapid growth of the electric power industry into vast interstate systems and the necessity for federal leadership in coordinating facilities. S. Rep. No. 621, 74th Cong., 1st Sess., pp. 17–18. The report of the Senate Committee on Interstate Commerce noted (*id.* at p. 48):

[13] The interstate transmission involved in *Attleboro* was a direct transmission between two utilities located in different states.

> It is obvious that no steps can be taken to secure the planned coordination of [the electric] industry on a regional scale unless all of the facilities, other than those used solely for retail distribution, are made subject to the jurisdiction of the [Federal Power] Commission.

On the other hand, Congress also made clear its intention not to interfere unduly with the powers of state regulatory commissions and to extend federal authority only to those matters which could not effectively be controlled by the states. *Ibid.*; see Section 201(a) of the Act.

Section 201 of the Act, as finally enacted, reflects those competing concerns of Congress. Thus, general Commission jurisdiction over utilities is defined broadly and with precision: The Commission is given jurisdiction over "all facilities" used for the transmission or sale of electric energy "in interstate commerce" (Section 201(b)); energy transmitted in interstate commerce is defined as energy "transmitted from a State and consumed at any point outside thereof" (Section 201(c)); and any person who owns or operates any such facilities is a "public utility" subject to various other provisions of the Act (Section 201(e)). While precise, the above definitions did not adequately recognize the expressed concern of Congress that state regulatory authority not be unduly impaired. Accordingly, terms of somewhat less precision, see *Connecticut Light & Power Co.* v. *Federal Power Commission,* 324 U.S. 515, 529–531, were used to limit the Commission's jurisdiction; exemp-

tions were created for facilities used in "local distribution" and facilities used only for the transmission of energy in intrastate commerce or for the transmission of energy consumed wholly by the transmitter (Section 201(b)). Finally, and most important, the Commission's rate jurisdiction over interstate sales was limited to sales at wholesale (*ibid.*); no authority over retail sales was granted.

The question presented in this case is whether FPL's facilities are used for the transmission of electric energy "in interstate commerce" so as to make FPL a "public utility" within the meaning of the Act. It is thus necessary to determine the meaning of the phrase "in interstate commerce."

In the first case to reach this Court under Section 201, *Jersey Central Power & Light Co.* v. *Federal Power Commission,* 319 U.S. 61, 70–71, a utility seeking to escape the jurisdiction of the Commission argued that the phrase "in interstate commerce" established a very restrictive test of jurisdiction; comparison was made to phrases such as "affecting commerce" or the "current of commerce" used in other regulatory statutes. The Court rejected such comparisons as tools for determining the scope of "in interstate commerce," noting that the phrase was precisely defined by the Act itself. 319 U.S. at 70–71. This view of the jurisdictional standard embodied in Section 201 was confirmed by this Court in *Connecticut Light & Power Co.* v. *Federal Power Commission, supra,* 324 U.S. at 529–531, where it was noted that

the "terms of the grant of federal power," as opposed to the terms of limitation employed by Congress to limit jurisdiction, were (324 U.S. at 529):

> * * * couched largely in the technical language of the electric art. Federal jurisdiction was to follow the flow of electric energy, an engineering and scientific, rather than a legalistic or governmental, test. * * *

See also *Federal Power Commission* v. *Southern California Edison Co.*, 376 U.S. 205, 209 n. 5, 215. Thus, the existence or absence of Commission jurisdiction over FPL turns on an analysis of the "engineering and scientific" data contained in the record before the Commission, an analysis the Commission is especially qualified to undertake.

Before turning to the bases for jurisdiction found by the Commission, we reemphasize the significance of this jurisdictional case. As noted, Congress was fully aware of the need for regional planning and coordination of electric systems when it passed the Federal Power Act amendments in 1935. But at that time only a fraction of the nation's systems were interconnected in interstate networks; since that time, interconnection has progressed markedly and the nation's bulk power systems are now being linked from coast to coast. Accordingly, in the words of the Commission, "the interstate nature of the electric business, and the need for Federal regulation, have steadily risen." Federal Power Commission Report on S. 1365, 90th Cong.,

printed in Hearings on S. 1365 before the Senate Committee on Commerce, 90th Cong., 1st Sess., p. 5.[14] See also Hearings on H.R. 5348 before Subcommittee on Communications and Power of the House Committee on Interstate and Foreign Commerce, 90th Cong., 1st Sess., p. 118.[15]

The only immediate effect of the Commission's order in this case will be to require FPL to follow the Commission's Uniform System of Accounts, thereby subjecting FPL's operations to regulatory and public scrutiny on the same basis as the operations of other utilities. The establishment of jurisdiction over FPL would, however, empower the Commission to order FPL to interconnect with other utilities under certain circumstances, thus improving reliability of service and making possible economies for both parties to the interconnection. See Section 202 of the Act and our brief in *Federal Power Commission* v. *Florida Power Corp.*, No. 469, 1970 Term, argued February 24, 1971. Commission jurisdiction would also subject FPL's wholesale rates for any future interstate power

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[14] S. 1365 was introduced by Senators Holland and Smathers of Florida following the Commission's decision in this case and would have exempted from Commission jurisdiction any utility whose facilities were located entirely within one state and which did not transmit or receive electric energy by direct interconnection from or to any other state or by indirect connection except for temporary or emergency purposes. The bill was never reported out of committee.

[15] H.R. 5348, although differing slightly in language, was the companion bill to S. 1365. See n. 14, *supra*. It too was never reported out of committee.

sales to regulation and FPL would be prohibited from granting undue preference to its wholesale customers as a class or discriminating among them individually (Sections 201(b) and 205). Finally, FPL would also be subject to the provisions of Sections 203 and 204 of the Act, requiring Commission approval of mergers, acquisitions and the issuance of securities, as well as the reporting and other requirements of Part III of the Act, Sections 301–319, 16 U.S.C. 825–825r.

In short, the establishment of jurisdiction in this case will subject one of the nation's largest electric utilities to the specific requirements of the Federal Power Act adopted by Congress to promote the coordinated and efficient deployment of the vast system of interconnected electric facilities which are necessary to meet the nation's power demands. And it will give the Commission the same authority over other similarly situated utilities.

II. SUBSTANTIAL EVIDENCE SUPPORTS THE COMMISSION'S DETERMINATION THAT TRANSMISSION OF ELECTRIC ENERGY BETWEEN FPL AND INTERCONNECTED SYSTEMS IN OTHER STATES IS ESTABLISHED BY THEIR ELECTROMAGNETIC UNITY OF RESPONSE

The question whether FPL owns and operates facilities for the transmission of electric energy "in interstate commerce" as that phrase is used and defined in Section 201 of the Federal Power Act is, as we have seen (pp. 21–22, *supra*), a question of "engineering and scientific" fact. The only inquiry on judicial review is whether the Commission's finding of the existence of that fact was supported by substan-

tial evidence. See Section 313(b) of the Act; *Federal Power Commission* v. *Southern California Edison Co.*, 376 U.S. 205, 209 n. 5. An analysis of the record shows that there was an abundance of engineering and scientific data to support the Commission's expert conclusion.

As we have set forth in some detail in the Statement (see pp. 7–11, *supra*), the expert evidence introduced before the Commission by the staff established that all of the elements of the interconnected interstate network of which FPL, Corp and Georgia are a part are locked together in electromagnetic unity. Thus, FPL, Corp and Georgia operate in synchronism—*i.e.*, precisely at the same frequency—and the addition of a load or the outage of a generator on one system evokes an almost instantaneous response on the other systems as all generators automatically slow down to provide the additional power necessary to meet the load. The hearing examiner's conclusion that this cause and effect relationship constitutes interstate transmission of electric energy (App. 270) reflects the physical reality of the situation. Clearly, for a generator in one state to alter its mode of operation by reason of the addition of a load in another state, an appropriate signal must be transmitted from the load to the generator. The signal—an electric impulse—is none other than a quantum of electric energy originating in one state and consumed in another.[16]

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[16] Compare *Pantomimic Corp.* v. *Malone*, 238 Fed. 135 (C.C.A. 2), where a corporation sought to get around a statute barring the importation of prize fight films by setting up a camera

The staff evidence, however, was not limited to the bare cause and effect relationship among interconnected facilities, but also concentrated on the degree of coordination of operations among FPL, the other members of the Florida Operating Committee and the other utilities forming the Interconnected Systems Group (see pp. 4–11, *supra*). The substantial interchanges of electric energy among FPL and other Committee members and between Corp and Georgia, the reliance by FPL on other systems for emergency power, and the common use by all ISG members of tie line control with frequency bias to regulate network frequency and to provide almost instantaneous emergency service, all support the conclusion that FPL is an integral part of a vast, coordinated interstate network. This evidence, together with the evidence on the electromagnetic unity of response, fully supports the Commission's conclusion that FPL does, in fact, own facilities for the transmission of electric energy in interstate commerce, *i.e.*, in the words of Section 201(c) of the Act, energy "transmitted from a State and consumed at any point outside thereof."

This Court's dictum in *Jersey Central Power & Light Co.* v. *Federal Power Commission*, 319 U.S. 61, 72, that "[m]ere connection determines nothing" does not compel a rejection of the Commission's determination here. In the first place, the Commission's finding

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eight inches on the American side of the Canadian border and exposing a banned film eight inches on the Canadian side of the border. The court found the action violative of the customs statute, notwithstanding the fact that only rays of light actually crossed the border.

here rested upon much more than the mere fact of FPL's interconnection with an interstate network. But more fundamentally, the Court in *Jersey Central* did not have before it the evaluation of extensive evidence of the interdependence of interconnected systems that was the basis for the Commission's decision in this case. Although some evidence on the synchronization of interconnected utilities was before the Commission in that case, see 129 F. 2d 183, 187, n. 1, the Commission's order finding Jersey Central to be a "public utility," was based upon an express finding that electric energy flows could be traced from Jersey Central over the lines of an intervening utility to the State of New York. 2 F.P.C. 541, 542–543. In view of the limited number of interconnections involved in that case and the relative ease with which the energy flows could be traced, there was no occasion for the Commission or this Court, in affirming the Commission, to consider other bases for jurisdiction. Since *Jersey Central,* however, several jurisdictional cases have arisen involving situations where the tracing of power flows is not practicable. The decisions of the Commission and courts of appeals in those cases support the Commission's decision here.

In *Indiana & Michigan Electric Co.* v. *Federal Power Commission,* 365 F. 2d 180 (C.A. 7), certiorari denied, 385 U.S. 972, the Seventh Circuit was faced with the question whether particular sales at wholesale of I & M, an admitted "public utility," involved electric energy in interstate commerce and thus were

subject to Commission regulation.[17] In finding all of I & M's sales at wholesale subject to its jurisdiction, the Commission noted that it was impracticable to trace energy flows from specific generating plants to specific loads, but concluded that interstate energy nevertheless pervaded the company's entire system. 365 F. 2d at 182. In upholding the Commission's conclusion, the court of appeals relied on the fact that I & M was part of a coordinated power pool operating as an integrated system in several states. The court noted that the "electric load of every customer of every operating company in the System is supplied with electric energy from the entire * * * pool" and also discussed at length the dynamics of interconnected power systems and the tie line and frequency control equipment employed by the systems. 365 F. 2d at 182-183. Similar results, based upon analyses of the mode of operation of interconnected utilities forming a power pool where tracing was impractical, were reached by the Sixth and Eighth Circuits in *Cincinnati Gas & Electric Co.* v. *Federal Power Commission,* 376 F. 2d 506 (C.A. 6), certiorari denied, 389 U.S. 842, and *Arkansas Power & Light Co.* v. *Federal Power Commission,* 368 F. 2d 376 (C.A. 8).[18]

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[17] Section 201(b) of the Act grants the Commission jurisdiction over "the sale of electric energy at wholesale in interstate commerce." Thus to reach any particular wholesale sale, the Commission must establish as a fact that the sale involves energy "in interstate commerce."

[18] The Commission, in *Arkansas Power & Light*, had noted in a passage of considerable relevance here (34 F.P.C. 747, 751, quoted by the court of appeals, 368 F. 2d at 382):

> An interstate electric network is dynamic and ever changing both with respect to load and to generation source. It is

Another wholesale rate case, *Public Service Company of Indiana* v. *Federal Power Commission*, 375 F. 2d 100 (C.A. 7), certiorari denied, 387 U.S. 931, provides an even closer analogy to this case. In contrast to the pooling arrangements of which I & M, Arkansas and Cincinnati were a part, PSCI's relations with its neighbors were far more limited. 34 F.P.C. 1513, 1516–1517. The company was, however, interconnected with six other utilities and, like FPL here, was part of a multi-state, integrated electric power system.[19] In upholding the Commission's as-

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an oversimplification, therefore, to talk in terms of a flow of electricity from point to point in an integrated power network of the type involved here. Instead, generation from each source in the system contributes directly or indirectly, and to an ever varying extent, to the energy present, in all parts of the system which are not isolated from out-of-state energy sources. The fact that, as a matter of engineering determination, identification of either the source or destination of particular units of energy within an interstate power system such as respondent's may be difficult and at times impossible does not detract from the interstate nature of the over-all operation. On the contrary, the more complex and comprehensive the nature of the interstate network, the more unlikely it will be that any energy sources will be measurably identifiable. The use of tracing to disprove that a particular sale of a company which is part of an electrically integrated interstate system is in interstate commerce is a wholly unrealistic methodology which is irrelevant to present day power system technology.

[19] Referring to the "mere connection" language of this Court in *Jersey Central*, the Commission had noted that "[t]o characterize PSCI's relationships with its neighbors, including those in or receiving power from other states, as mere interconnection is simply to ignore the record." 34 F.P.C. 1513, 1517–1518. Much the same observation can be made with respect to FPL in this case.

sertion of jurisdiction over PSCI's sales at wholesale, the Seventh Circuit followed the rationale of the *I & M* and *Arkansas* cases and held that the Commission was not required to make specific tracings of power flows. 375 F. 2d 103–104.

The court below sought to distinguish the above cases on two grounds: (1) that the utilities there involved were all members of interstate power pools and (2) that establishing wholesale rate jurisdiction over an electric company already subject to Commission jurisdiction is a different matter from establishing jurisdiction over a company in the first instance (App. 369–371). Neither distinction, in our view, is significant.

While undoubtedly FPL's participation in the Florida Operating Committee and the ISG lacks the scope of the pooling arrangements of which I & M, Arkansas, Cincinnati and, to a lesser extent, PSCI were a part, the difference is only one of degree and is not material to the issue whether interstate energy is present in a system or a particular portion of a system. As we have shown (see pp. 11, 26, *supra*), FPL receives substantial benefits from its participation in the multistate network to which it is electromagnetically locked.

The second attempted distinction is based on the lower court's view that wholesale cases "have little application to the problems of federalism and reservations of power to the states imposed by the instant

case, where the issue is one of whether FPL is a public utility at all * * *" (App. 371). As our review of the legislative history of the 1935 amendments to the Federal Power Act indicates, however (see pp. 19–21, *supra*), problems of federalism were very much behind the limitation of Commission rate jurisdiction to sales at wholesale of electric energy in interstate commerce, since the assertion of federal jurisdiction necessarily preempts the jurisdiction of any state authority over such sales. See *Federal Power Commission* v. *Southern California Edison Co.*, 376 U.S. 205, 210–216. In *Southern California*, this Court referred to the debates in Congress in 1935 concerning the scope of federal wholesale jurisdiction under the proposed amendments and the ultimate decision, based largely on an interpretation of *Public Utilities Commission* v. *Attleboro Steam & Electric Co.*, 273 U.S. 83, to—

> * * * draw a bright line easily ascertained, between state and federal jurisdiction * * * making FPC jurisdiction plenary and extending it to all wholesale sales in interstate commerce except those which Congress has made explicitly subject to regulation by the States [376 U.S. at 215–216].

Congress employed the same "in interstate commerce" standard to govern Commission jurisdiction over electric utilities as it employed to govern jurisdiction over sales at wholesale; there is no indication in the legislative history that this "bright line" was not to be the same in both situations.

III. SUBSTANTIAL EVIDENCE ALSO SUPPORTS THE COMMISSION'S DETERMINATION, AS AN ALTERNATE BASIS FOR JURISDICTION, THAT THE STAFF TRACING STUDIES ESTABLISHED THAT ELECTRIC ENERGY HAD ON OCCASION FLOWED FROM GEORGIA TO FPL AND FROM FPL TO GEORGIA.

Since the passage of the 1935 Federal Power Act amendments, the Commission has in several cases sought to establish its jurisdiction—either over an electric utility as a "public utility" or over a particular sale at wholesale—by tracing power flows through the readings of commercial meters to show the presence of interstate electric energy on a given system or on part of a given system. In some cases, such as *Jersey Central Power & Light Co.* v. *Federal Power Commission,* 319 U.S. 61 (discussed at pp. 21, 26–27, *supra*), the task of tracing has been simple due to the limited number of interconnections involved. In other cases, such as those discussed at pp. 27–30, *supra,* the systems have been of such complexity that no tracing—or very limited tracing at best—has been practicable.[20] Finally, there has been a middle category of cases where tracing is possible, but is so involved that the methods used have required refinement to take into account the fact that energy generated outside of a

[20] In *Public Service Company of Indiana, Inc., supra,* p. 29, where a very limited tracing study had been introduced by the staff, a staff witness testified before the Commission that tracing was neither feasible or practicable for studying the PSCI system. Any such study, he estimated, would take from one to two years assuming no changes in the structure of the system. If changes occurred, however, restudy would be necessary making it almost impossible to complete the study. 375 F. 2d at 104, n. 7.

state frequently becomes commingled on a system's transmission lines with energy generated within the state. The Commission's treatment of such commingled energy as interstate energy has been approved by this Court. See *Pennsylvania Water & Power Co.* v. *Federal Power Commission*, 343 U.S. 414, 419–420; see also *Wisconsin-Michigan Power Co.* v. *Federal Power Commission*, 197 F. 2d 472 (C.A. 7).

The present case falls within the middle category: Refined tracing techniques can be and were used to show that electric energy flowed from Georgia over the transmission lines of Corp to FPL and from FPL over the same transmission lines to Georgia. While we submit that in this modern age of vastly complex electrical networks, the tracing of power flows is an unnecessary and inefficient procedure for determining Commission jurisdiction,[21] the fact remains that tracing was used in this proceeding and provides a firm, alternate basis for the Commission's assertion of jurisdiction over FPL.

The court of appeals rejected the staff's utilization of the commingled method of tracing power flows, ruling that the "engineering and scientific fact test

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[21] As long as tracing plays a significant role in jurisdictional proceedings before the Commission, electric utilities seeking to avoid jurisdiction will be encouraged to arrange their interconnections with other utilities, not to maximize the coordination and efficiency of the interconnected systems, but to make the tracing of interstate power flows as difficult as possible. Such a result would, of course, be undesirable and would result in a triumph of form over substance. Cf. *Pantomimic Corp.* v. *Malone*, *supra*, n. 16.

for interstate flow of energy is not met by postulating a simplified characterization of how, for various purposes of convenience, energy may be treated as flowing" (App. 367–368). What the court overlooked, however, is that any tracing method is necessarily based on a simplified model of an electric system as all tracing methods employ readings from commercial meters. As we have noted (see pp. 12–13, *supra*), most commercial meters record only net electrical data and do not reflect the actual physics of a three phase alternating current system. Thus, the developing of a method for tracing power flows necessarily depends upon expert judgment to assure that the approximate and simplified model of an electric system employed by the method reflects as closely as possible the physical dynamics of modern power transmission.

The court of appeals correctly noted that the flow of electric energy is a "complex and not yet fully explainable" phenomenon (App. 365). The staff, presented, however, extensive evidence on what is known about three-phase power systems and compared different tracing methods to determine which method best took into account the known attributes of such power (see pp. 12–14, *supra*). In short, the staff concluded that the commingled tracing method's treatment of a bus as a point or reservoir adequately reflected the fact that three-phase power consists of both positive and negative power pulses moving in both

directions—a phenomenon not recorded by commercial meters.[22]

The hearing examiner heard all of the conflicting testimony on tracing methods and the dynamics of three phase power, frequently interrupting the lawyers and the witnesses to interject his own questions. Accordingly, he was in the best position to weigh the evidence and his determination that the commingled method and its assumptions adequately reflect the physical reality of three-phase alternating current is entitled to great weight. On the basis of the evidentiary record and the hearing examiner's analysis, the Commission was fully justified in accepting the results of the staff's tracing studies as a basis for jurisdiction over FPL.

The court of appeals' reversal of the Commission in this case rested upon its judgment that the Com-

[22] Dr. Jessel testified (App. 47) that the commingled tracing method had been used in two earlier formal proceedings before the Commission: *Pennsylvania Water & Power Co.*, 8 F.P.C. 1, affirmed *sub nom. Pennsylvania Water & Power Co.* v. *Federal Power Commission*, 193 F. 2d 230 (C.A. D.C.), affirmed, 343 U.S. 414, and *Wisconsin-Michigan Power Co.*, 10 F.P.C. 170, affirmed *sub nom. Wisconsin-Michigan Power Co.* v. *Federal Power Commission*, 197 F. 2d 472 (C.A. 7). While neither of the Commission's decisions in those cases discusses the commingled method's treatment of a bus, a later Commission decision refers to the treatment of a bus as a point in the *Pennsylvania Water & Power Co.* tracing studies. See *City of Colton* v. *Southern California Edison Co.*, 26 F.P.C. 223, 231, reversed *sub nom. Southern California Edison Co.* v. *Federal Power Commission*, 310 F. 2d 784 (C.A. 9), reversed, 376 U.S. 205.

mission had not demonstrated with sufficient scientific certainty that there are "actual" transmissions of interstate energy on FPL's facilities. The court did not find that the Commission had committed any error of law; nor did it find that the evidence required acceptance of the "systems study" tracing method advocated by FPL. Rather, the court held simply that the Commission cannot exercise jurisdiction over a major utility such as FPL unless and until it can convince a court of scientific laymen that, in commonsense terms, some identifiable thing moves across state lines. This is, we submit, an unsatisfactory approach to the "engineering and scientific" test of jurisdiction, see *Connecticut Light & Power Co.* v. *Federal Power Commission, supra,* p. 20. The statutory scheme evidently contemplates that the Commission either has or does not have jurisdiction over FPL, and it is not enough to say that the Commission must abstain until such time—if ever—as it can be proven as a "fact" in common law terms that there is an "actual" transmission. As in other regulatory areas, decision cannot be avoided on the ground that no decision can have absolute certainty; it is the very impossibility of such certainty that led Congress to commit the matter to the expert judgment of an administrative agency.

We recognize that the Commission had the burden of establishing the jurisdictional premise, but we submit that it did so when it determined, on the basis of careful consideration of the best expert opinion, that, in scientific terms, there are interstate transmissions on FPL's facilities. If, as is well established, the test of jurisdiction is to be truly a scientific test,

the expert administrative body must be allowed to use a scientific definition of what a "transmission" is. This is not like the traditional judicial situation where, for example, psychiatric experts are called to assist a lay finder of fact in determining whether a defendant is, in layman's terms, sufficiently sane to be responsible for his actions. The court below has, we think, improperly tried to fit the issue in this case into that traditional mold, and in so doing has lost sight of the unique nature of the administrative process, which places such determinations in the hands of an expert body, with only limited judicial review to consider whether substantial evidence supports that body's determination. Cf. *Sunshine Anthracite Coal Co.* v. *Adkins,* 310 U.S. 381, 399–401; *Gray* v. *Powell,* 314 U.S. 402, 411–414; *Griggs* v. *Duke Power Co.,* No. 124, 1970 Term, decided March 8, 1971, slip op. pp. 8–9. Here, as we have shown, the Commission's expert conclusion is amply supported by substantial evidence; in holding otherwise, the court of appeals has improperly acted on the basis of its own inexpert views.

As we have suggested, the economic realities of FPL's relationship with the network of its interconnected utilities militate strongly in favor of federal regulation. A major purpose of the 1935 amendments that produced Section 201 was to provide federal coordination of the nation's electrical systems, and that purpose will evidently be facilitated by jurisdiction over FPL, the nation's ninth largest system in terms of sales. We are not, of course, suggesting that an economic test be substituted for the established scientific test of federal

jurisdiction. We do urge, however, that the need for federal regulation in these critical days for the nation's electric power resources should not be defeated when, as here, the scientific premises for federal jurisdiction have been properly established.

CONCLUSION

For the foregoing reasons, the judgment of the court of appeals should be reversed.

Respectfully submitted.

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MAY 1971.

U.S. GOVERNMENT PRINTING OFFICE: 1971